

than the rest, so that the scape wheel is outside the frame, i. e. above it in the position described, being supported by a bearing not in the frame itself, but in a separate piece bent and riveted to the frame. This piece must be cut away and a new bearing made for the shaft under the scape wheel instead of above, which any ingenious boy can easily do. This leaves the scape wheel free to carry the seed pans.

Solder the middle of a stout, horizontal brass wire six inches long to the face of the scape wheel, and to each end of this wire a deep tin pill-box, an inch and a half in diameter, one for a seed pan and the other to be filled with ballast for a counterpoise. The edge of the pill-box, not its face, should be towards the wheel, and the face of it should be inclined at an angle of about sixty degrees to the horizon so that the radicles of the germinating seeds in their downward growth may press against the advancing face of the box. Most of this face should be cut away and a piece of glass put inside to serve as a window. Against this put the seeds, already germinated so that their radicles begin to appear, placing the radicles so as to point downward; fill the box with moist saw-dust, and set it going in a warm place, using a heavy driving weight (I used about twelve pounds). This will make the brass arms carrying the pill-boxes revolve at a sufficient rate to create considerable centrifugal force in the boxes. The germinating radicles will feel the force of this enough to deflect them at a considerable angle from the perpendicular.

The apparatus will run several hours and if you do not want to sit up nights to wind it, all the better, as the direction of growth during the night will be so obviously different from that during the day when the apparatus is running as to make the experiment more conclusive.—GOODWIN D. SWEZEY, *Crete, Nebraska*.

Notes from Columbus, Ohio.—Among my last summer's collections from this vicinity was a form of *Bidens connata* Muhl. which was typical in every respect except that it had upwardly barbed awns. Dr. Sereno Watson, to whom the specimen was submitted, pronounced it unchanged in other characters. In making a revision of Sullivant's catalogue of plants of this vicinity, I find mention of plants near *B. frondosa* L., "except smaller and smoother; heads fewer-flowered, with pappus upwardly scabrous."

The following species of western plants, with the exception of *Dysodia* (not heretofore known in this locality), were collected the last of October about the winter-quarters of Sells Brothers' Circus, at Sellsville, Ohio, near Columbus, the *Croton* alone being out of bloom: *Erodium cicutarium*, *Aster pauciflorus*, *Amphiachyris dracunculoides*, *Dysodia chrysanthemoides*, *Gutierrezia Texana*, *Helenium nudi-*



florum, *H. tenuifolium*, *Parthenium Hysterophorus*, *Solanum rostratum*, *Monarda citriodora*, and *Croton capitatum*. The plants were first noticed by W. J. Greene of the Ohio Experiment Station, and appeared to be growing well and spreading. The seed was evidently scattered from cars or wagons upon the return of the show at the close of the season.—AUG. D. SELBY, *Columbus, Ohio*.

Continuity of the protoplasm in the *Chantransia* form of *Batrachospermum*.—Strasburger (*Botanisches Practicum*, p. 403, 2nd German edition), mentions the fact of the continuity of the protoplasm between the cells of filaments of *Batrachospermum*. The writer's attention was attracted to this phenomenon while studying the *Chantransia* form of one of the species of *Batrachospermum*, probably *Chantransia (Batrachospermum) macrospora*, from Florida; and the protoplasmic connection was so evident that he thought the readers of the *BOTANICAL GAZETTE* might be interested in his observations.

The phenomenon was first noticed in a slide of the alga which had been mounted in glycerine jelly. In preparing the specimen for the jelly the glycerine had caused a slight shrinkage of the cell-contents, drawing it away from the cell-walls in all parts of the cells except at the ends, where fine threads of protoplasm which pierced the end walls were plainly seen to connect the shrunken masses of protoplasm in the different cells. The figure, showing this condition, was drawn from a filament on this slide with a Abbé camera, power 600 diameters, (reduced one-half).



A very satisfactory way of demonstrating the presence of the connecting fibril is to stain the alga filaments with an alcoholic solution of eosin, wash in water, and then carefully shrink the contents of the cells with dilute glycerine. The water washes the eosin out of the cell-walls leaving the granular matter of the cells deeply stained and the connecting protoplasmic threads slightly colored. Borax carmine also gave satisfactory results. Iodine and methyl violet did not differentiate clearly enough, the cell-walls being so deeply stained as to obscure the protoplasmic connections. However, the green filaments, with the contents shrunken a little,

exhibit the connecting fibril in an unmistakable way. The *Chantransia* form is better to demonstrate the continuity of the protoplasm than the sexual form, because the cells are as a whole much larger.—BRADLEY M. DAVIS, *Indiana University, Bloomington*.

A method of studying the growth of tubers.—After a careful examination of all the literature on tubers and tubercles at hand it appears